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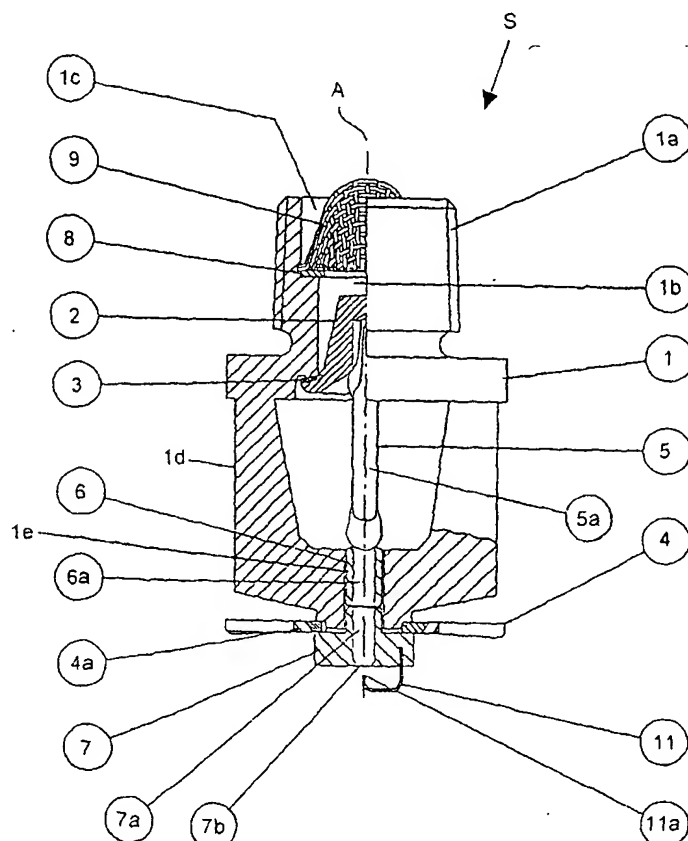
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[Continued on next page]

(54) Title: SPRINKLER HEAD WITH A DOUBLE DEFLECTOR ARRANGEMENT



(57) Abstract: The invention relates to a sprinkler having a liquid outlet mouthing (8) and a first deflector device (1d, 4) that is arranged downstream relative to the liquid outlet mouthing (8), and that comprises an impact face for a portion of the liquid from the liquid outlet mouthing (8). The sprinkler is characterised, in that the first deflector device (1d, 4) also comprises a through-going opening (6) that is configured to allow passage by a central portion of the liquid flow; and that the sprinkler comprises a second deflector device (11) that is arranged downstream relative to said through-going opening (6), and that comprises an impact face (11a) for at least one portion of the liquid that passes through the through-going opening (6).

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SPRINKLER HEAD WITH A DOUBLE DEFLECTOR ARRANGEMENT

The present invention relates to a sprinkler for extinguishing fire and of the kind featured in the preamble to claim 1. Sprinklers of this kind are commonly known, cf.
5 eg. European patent No. 701,465, and are typically supplied with waterworks water, but in some cases, however, it can be fed with other fire extinguishing media.

10 It is the object of the invention to solve those particular problems that characterise the extinguishing of fires in deep fryers. It is well known that in order to extinguish such fire, water should not there and then be sprayed on the deep-fry oil. This is due to the fact that
15 the water will seek towards the bottom of the frying oil and evaporate there with an ensuing explosion-like effect whereby the hot oil is ejected from the apparatus. However, the prior art sprinklers have not allowed optimal fighting of fires in deep fryers.

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It is also an object of the invention to provide a sprinkler for extinguishing such oil fires, which sprinkler can be connected to existing water-work installations, including also existing sprinkler apparatuses.

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These problems are solved with the invention as defined in the characterised part of claim 1, wherein the sprinkler comprises a particular arrangement in the form of a first as well as a second deflector device for an out-
30 flowing fire extinguishing liquid. In that the liquid outlet mouthing is configured for producing an approximately cylinder-faced flow of liquid and a central flow of liquid, particularly favourable distribution characteristics are obtained for the fire extinguishing liquid.

It should be added that the field of application for the invention is not restricted to extinguishing fires in deep fryers, the sprinkler according to the invention being applicable wherever there is a risk of fires in localised masses of oil.

By the invention, interaction between drops formed by the first and the second deflector device, respectively, it is possible to provide an extremely potent mist of very small drops of liquid that is directionally oriented towards the fire and that forms a readily evaporable layer immediately above the surface of the oil whereby any oxygen present is repressed. Simultaneously, the upper or first deflector device of the sprinkler also emits a flow of slightly larger drops that disperse across the surface of the burning oil and also on the surroundings. When the latter drops evaporate heat energy is consumed from the surroundings, including eg the deep fryers with an ensuing cooling thereof. All in all the fire can be extinguished completely within a relatively short period of time as a consequence of the combined effect of the two deflector devices.

Tests have shown that the sprinkler according to the invention operates effectively also in case of relatively low fire-extinguishing-liquid pressures, such as pressures of between 2 bar and 12 bar, whereby the sprinkler may also be connected to ordinary waterworks' installations. Besides it is a property of the sprinkler that the liquid density pr. square unit is approximately constant in a large liquid-pressure area.

In order to convey the liquid to the deflector devices in the manner stated, the liquid outlet mouthing can be provided with a disc-shaped means having in essence the shape of a circular arch and a central opening as featured in claim 2. By the embodiments featured in claims 3, 4 and 5 a particularly convenient distribution of the fire-extinguishing medium is obtained.

By the preferred embodiment featured in claim 6, parts of the flow of liquid passes from the outlet mouthing through said holes and elongate apertures arranged in the impact face of the first deflector device. These holes and apertures are preferably configured to produce a very fine droplet formation from the passing fluid and said fine droplets collide with liquid drops reflected from the second deflector device to provide a particular fine atomisation of the liquid and thereby optimal formation of said mist immediately above the oil.

By the invention a sprinkler is also provided that is suitable for extinguishing conventional fires as well as for extinguishing deep fryer fires. The sprinkler according to the invention can thus be manufactured without regard to the final application. This latter is expressed in particular in the embodiment featured in claims 8 and 9. The dimension of the passage featured in these claims do, in this case, express the diameter that is useful in claims 3, 4 and 5.

The invention will now be explained in further detail with reference to a number of presently preferred embodiments.

Figure 1a is a partial sectional view through the sprinkler;

Figure 1b is an exemplary embodiment of the first deflector device;

Figure 2 is a cross-sectional view through a part of the first deflector device;

Figure 3 is a top plan view of a disc-shaped means for producing an advantageous flow from the outlet mouth of the sprinkler;

Figure 4 is an exemplary system for the supply of a fire-extinguishing medium;

Figure 5 shows a variant of the system shown in Figure 4;

Figure 6 shows a piston release mechanism for the sprinkler;

Figure 7 shows an alternative, cut-release mechanism for the sprinkler;

Figure 8 shows a sprinkler installation arranged in connection with a deep fryer;

Figure 9 shows an electronic actuation system for the sprinkler shown in Figure 8; and

30

Figure 10 shows a further development of the system shown in Figure 9.

In Figure 1a the letter S is used to generally designate a sprinkler according to the invention. In a conventional manner the sprinkler comprises a housing portion 1 with a through-going passage 1b having a central axis A. The housing portion 1 is exteriorly provided with a thread 1a that allows attachment of the housing portion at the end of a not shown supply pipe for fire-extinguishing liquid. At the bottom of the Figure and in extension of the housing portion 1, a yoke extends that comprises two legs 1d and has a through-going bore 6 at the bottom. Interiorly of the passage 1b, the housing portion 1 has a filter body 9 arranged at the inlet 1c to the passage 1b.

Immediately below the filter 9, a disc-shaped means 8 is provided whose function will be subject to further explanation. The disc-shaped means 8 defines an outlet mouth-ing for liquid for the sprinkler S. Underneath the disc-shaped means 8, at the outlet from the passage 1b, a valve body 2 is arranged that is, in a conventional manner, secured in the shown closing position by means of a liquid-filled glass ampoule 5 that abuts, at the one end, on the valve body 2 and that abuts, at the other end, on the upper edge of a mounting device 1e that is introduced and secured in the bore 6 in the yoke, eg by screwing. During manufacture of the sprinkler S the valve is introduced into the position shown following which the ampoule is arranged as shown. The mounting device 1e is subsequently screwed so far home that it abuts on the end of the ampoule 5 that is, in this manner, secured in its correct position.

By means of an tightening device 7 a first deflector device is also attached to the yoke, having the form of a disc 4 with a surface that forms an impact face for a

part of the liquid that flows out of the outlet mouth-
ing 8 for liquid. The mounting device 1e and the tightening
device 7 can alternatively be configured as a coherent
part 10, as shown in Figure 6. The disc 4 is preferably
5 of the type shown in Figure 2 of European patent No.
701,465 that is subsequently incorporated herein by ref-
erence, and it can thus comprise radially extending,
elongate apertures A as shown in Figure 1b. It is fur-
thermore noted that, alternatively, the disc 4 can be
10 formed integrally with the legs 1d.

It will appear from Figure 1 that the mounting device as
well as the tightening device 7 has an interior, through-
going passage 6a,7a that allows passage of a portion of
15 the liquid that flows out of the outlet-mouthing 8 for
the liquid when the ampoule 5 has been blown away under
the impact of fire. The passage 6a,7a is aligned with the
central axis A and may have a diameter of between about
0.5 mm and about 5 mm. The through-going passage 7s is,
20 at the outlet, provided with a narrow portion 7b. Immedi-
ately below the narrow portion 7b at a distance of pref-
erably between about 0.5 and about 10 mm a further de-
flector device 11 is provided that has an impact face 11a
that is hit by liquid that leaves the passage 7a. The de-
25 flector device 11 can be in the form of a pin that has
the shape of a U with a shortened leg and it can be
screwed into the tightening device 7. Alternatively the
impact face 11a can be arranged eg on a yoke positioned
underneath the tightening device 7.

30

It will be understood from the above that a portion of
the liquid that flows out of the outlet mouth-
ing 8 for the liquid hits the impact face of the disc 4 in order to
be dispersed in a conventional manner across the burning

area according to a flat cone. The elongate passage apertures of the disc 4 also yield in a downwardly oriented flow of the liquid with the shape of a more pointed cone.

5 As shown in Figure 1a, the deflector disc 4 can optionally comprise a number of small passage apertures 4a arranged along a circular arch with the axis A as centre. The apertures 4a are configured for generating a certain degree of increased atomisation of the liquid that hits
10 the surface of the deflector disc 4. Figure 2 shows the cross sectional shape of a passage aperture 4a. The shown, preferred configuration of the aperture with conical inlet and outlet portions generates particularly effective atomisation of the liquid into very small drop-
15 lets.

A portion of the liquid that flows through the passage 6a,7a will, as will appear, hit the impact face 11a in order to be fragmentised into small droplets at this
20 point. The fragmentation can be varied by change of the diameter of the impact face relative to the diameter of the narrow portion 7b. A further and extremely advantageous fragmentation of these droplets will occur when the droplets meet the atomised liquid that leaves the passage
25 apertures 4a and the elongate apertures in the deflector plate 4.

Figure 3 shows the disc-shaped means 8 that forms the outlet mouth of the sprinkler. The disc-shaped means 8
30 is configured for producing a specific outflow of liquid that has been found to be particularly convenient for the sprinkler according to the invention. It will be understood that preferably the disc-shaped means 8 is arranged in the same manner as the disc-shaped means that is

claimed in European patent No. 701,465. The disc-shaped means 8 is more specifically configured with a central opening 93, whose centre coincides with the axis A of the sprinkler S and whose diameter can be selected to be between about 0.5 times and twice the diameter of the passage 7a. At a distance from this opening 93 the means 8 is provided with circular-arched openings 91 and 92, respectively, that are preferably arranged along a circle having the same diameter as the circle along which passage apertures 4a, if any, in the deflector disc 4 are arranged. It will be understood that the disc-shaped means is hereby able to produce an approximately cylinder-faced flow of liquid defined by the openings 91, 92 and a central flow of liquid that is defined by the opening 93 and that passes along the central axis A. Thus a division of the flow of liquid is thus produced thereby generating a well-defined amount of liquid corresponding to the selected dimension 10 of the central opening 93 that can be directed towards the impact face 11b, whereas the remaining amount of liquid can be caused to flow down towards the deflector plate 4.

Figure 4 illustrates an example of a system for the supply of a specifically selected fire-extinguishing medium while using the sprinkler according to the invention. One or sprinklers S are thus connected to a receptacle 18 that contains a fire-extinguishing medium 16 separated from a liquid supply by means of a flexible membrane 17 with a breakable portion 12. The membrane compensates for thermal expansions of the fire-extinguishing medium 16 whereby high-pressure build-ups within the receptacle 18 are avoided. In case of fire, the sprinkler S designated by the reference numeral 15 is activated, the liquid pressure from the liquid supply rupturing the breakable

portion 12 of the membrane 17 and compelling the fire-extinguishing medium out through the sprinkler 15. The liquid from the liquid supply will gradually admix with the fire-extinguishing medium.

5

By the variation shown in Figure 5 of the system shown in Figure 4, a receptacle 194 with a fire extinguishing medium and provided with a downwardly extending inlet pipe 192 is provided, wherein there is generated within said
10 receptacle a controlled volume of air 193 when the receptacle 194 is charged through the inlet pipe 192. A check valve 191 allows influx of liquid into the receptacle 194. The enclosed volume of air will compensate for thermal expansion of the fire-
15 extinguishing medium, which is of particular importance in those instances where the receptacle 194 is mounted in the immediate vicinity of hot deep fryer plants.

Figure 6 illustrates an advantageous arrangement that al-
20 lows an electronically controlled crushing of the ampoule 5. An electrical impulse thus heats a filament 60d that ignites a pyrotechnical charge 60b whereby a gas pressure is built within an activation unit 60 secured relative to the sprinkler 1. This pressure causes a piston 60a that
25 abuts on a loose impact rod 62 to move and break the glass ampoule 5. Figure 7 illustrates an alternative arrangement wherein the ampoule 5 is cut in two by means of a cutter 71 that can be influenced by the pulling of a cable 74. Advantageously such arrangements are used in
30 the systems shown in Figures 9 and 10.

Figure 8 shows a sprinkler installation mounted in a fume hood 52 and intended for use in connection with a deep

fryer plant 51. The installation is suitable for use in connection with the systems shown in Figures 9 and 10.

In Figure 9, a thermo sensor can, by means of a temperature switch 43, be set to emit - via a power supply 45 - an electrical impulse to the filament 60d shown in Figure 6 or to produce a pull in the cable 74 shown in figure 7 when the temperature of the frying oil exceeds the normal temperature of use of about 250°C and lower than the ignition temperature of the oil of about 350°C. Hereby the sprinkler 46 is activated. Optionally the system can comprise a switch 48 that can, simultaneously with or optionally earlier regulated by a time delay relay 47, switch off the power supply to the deep fryer plant. In case the electrical activation system was to fail, the sprinkler is activated in a conventional manner for extinguishing the fire when the oil has reached its ignition temperature.

In principle, the system shown in Figure 10 can constitute a further development of the system shown in Figure 9, since a liquid flow contact 80 activates a power supply line 85 when liquid flows through a supply conduit for fire-extinguishing medium to a sprinkler 81. By means of the power supply 85, flow signals can subsequently be emitted to a number of activation units 83, 84, 85 that can switch off the power supply eg to the deep fryer plant 82, to a fire damper or to fire doors, etc.

The systems shown in Figures 9 and 10 can also be used in connection with other types of sprinklers than the sprinkler S according to the invention. This also applies to the disc-shaped means 8.

C l a i m s

1. A sprinkler with a liquid outlet mouthing (8) and a first deflector device (1d,4) that is arranged downstream relative to the liquid outlet mouthing (8), and comprising an impact face for a part of the liquid from the liquid outlet mouthing (8), **characterised in that**

- 10 - the first deflector device (1d, 4) also comprises a through-going opening (6) configured for allowing passage of a central portion of the liquid flow;
- the sprinkler comprises a second deflector device (11) arranged downstream relative to said through-going opening (6), and comprising an impact face (11a) for at least a part of the liquid that passes through the through-going opening (6); and
- 15 - the liquid outlet mouthing (8) is configured for producing an approximately cylinder-faced liquid flow and a central liquid flow that passes along a central axis of said cylinder face.
- 20

2. A sprinkler according to the preceding claim, **characterised in that** the liquid outlet mouthing comprises a disc-shaped means (8) with an opening (91,92) having substantially the shape of a circular arch and a central opening (93) for forming said liquid flows.

25

3. A sprinkler according to the preceding claim, **characterised in**

- 30 - that the through-going opening (6) in the first deflector device (1d,4) is round; and
- that the central opening (93) is round and has a diameter of between about 0.5 and twice the diameter

of the through-going opening (6) in the first deflector device (1d,4).

4. A sprinkler according to one of the preceding claims,
5 **characterised in** that the impact surface (11b) on the second deflector device (11) is round and has a diameter of between about 0.5 and 1.5 times the diameter of the through-going opening (6) in the first deflector device (1d,4).

10

5. A sprinkler according to any one of the preceding claims, **characterised in** that the through-going opening (6) in the first deflector device (1d,4) has a diameter of between about 0.5 mm and about 5 mm.

15

6. A sprinkler according to any one of the preceding claims, **characterised in** that the impact face on the first deflector device (1d,4) comprises a series of through-going openings (4a) arranged along a circular
20 arch that has said through-going opening (6) as its centre, and a number of radially extending, elongate apertures that originate in the centre.

7. A sprinkler according to one of the preceding claims,
25 **characterised in** that the second deflector device (11) is configured as a substantially U-shaped body having a free end that forms said impact face (11b) for at least a portion of the liquid that passes through the through-going opening (6).

30

8. A sprinkler according to one of the preceding claims, wherein the liquid outlet opening (8) also comprises a valve body (2) and a release means (5) configured to allow, in case of elevated temperatures, movement of the

valve body (2), wherein the release means (5) extends between the valve body (2) and a mounting device (1e,7) for the release means (5), said mounting device (1e) being configured for connection with the first deflector device (1d,4), characterised in that the mounting device (1e,7) is received in a bore in the deflector device (1d,4) and comprises a passage (6a,7a) that defines said through-going opening (6a).

10 9. A sprinkler according to the preceding claim, characterised in that the first deflector device comprises at least one leg (1d) that extends in a direction from the liquid outlet mouth (8); and that the associated impact face is formed on a disc-shaped body (4) separate from the said at least one leg, which the disc-shaped body (4) is preferably secured to the leg by means of
15 said mounting device (1e,7).

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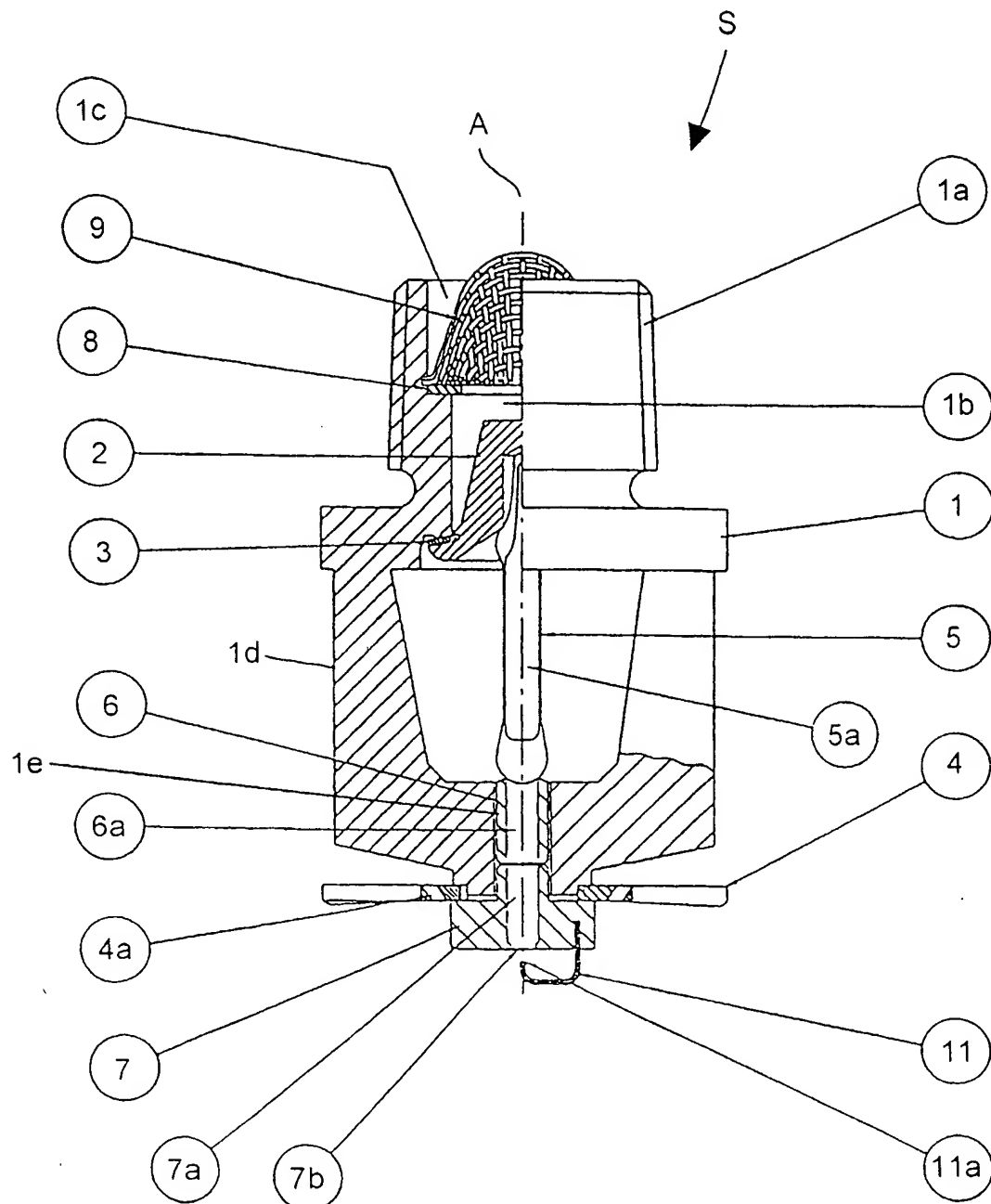


Fig. 1a

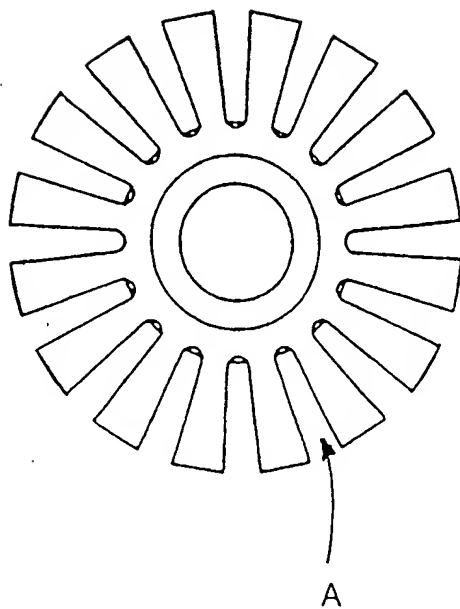


Fig. 1b

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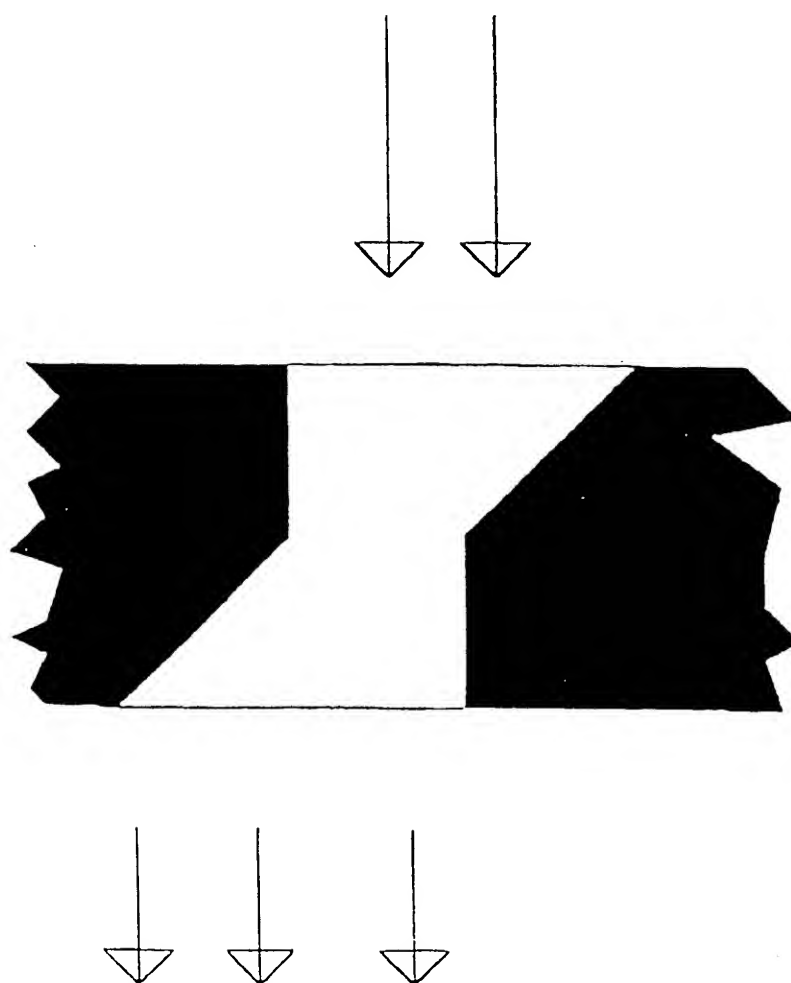


Fig. 2

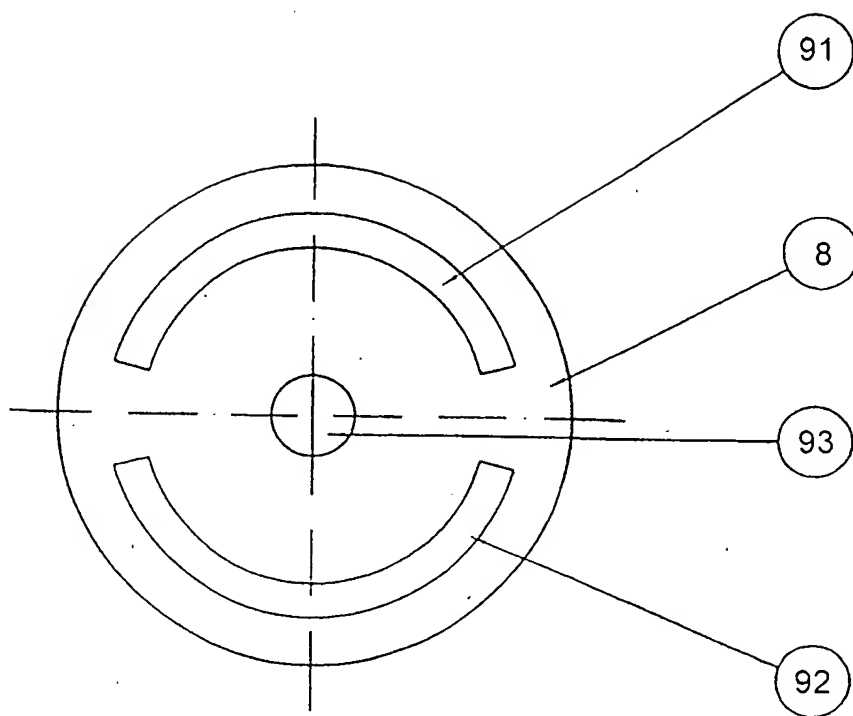


Fig. 3

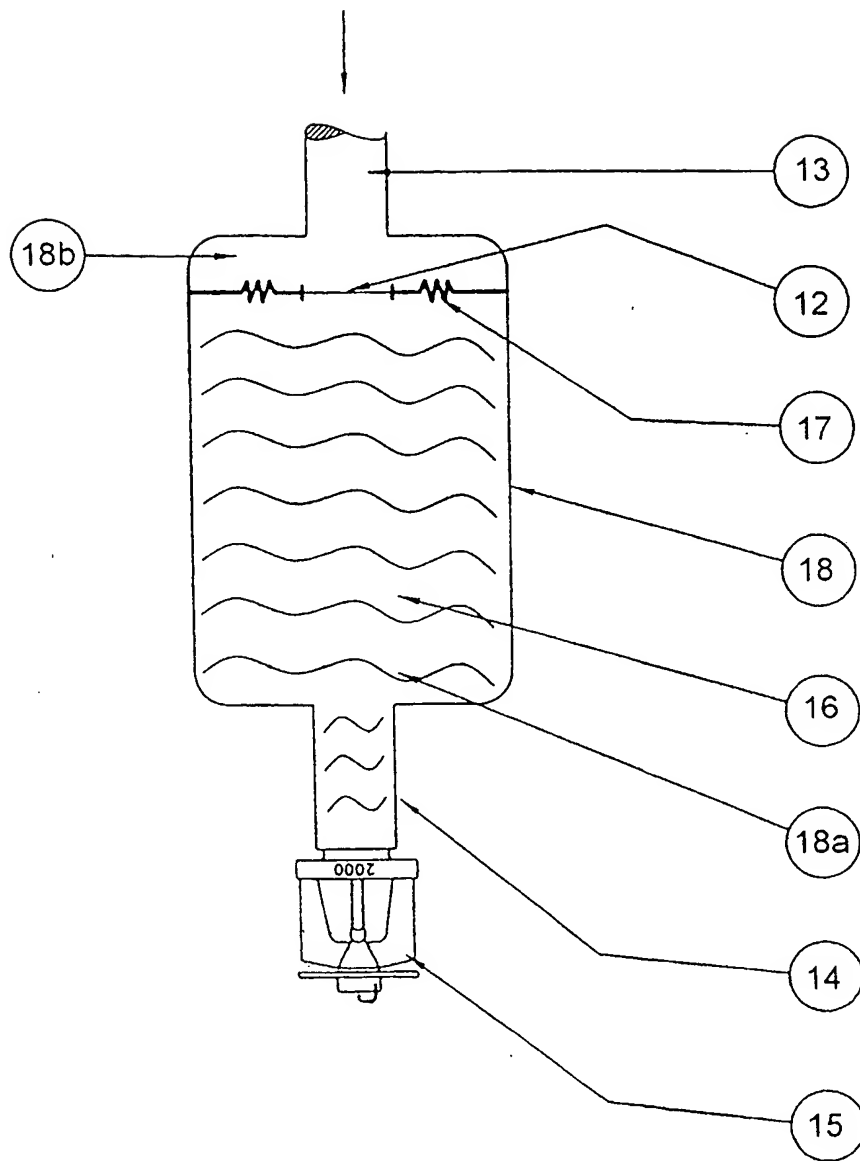


Fig. 4

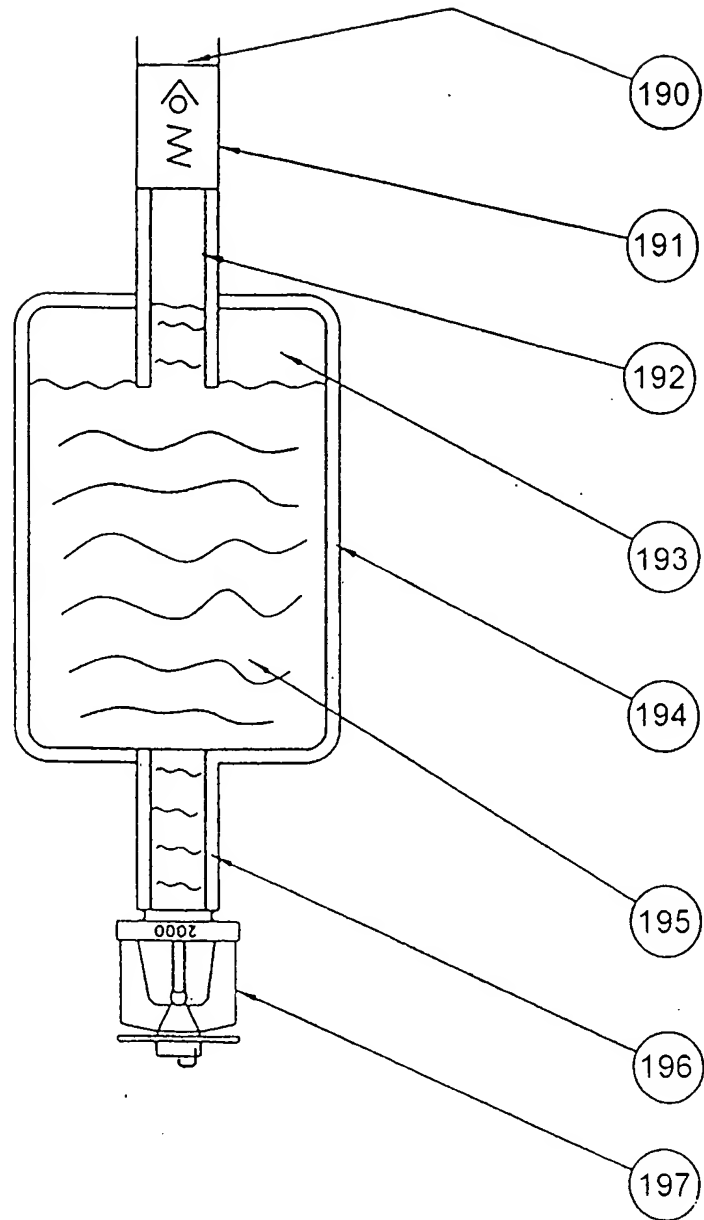


Fig. 5

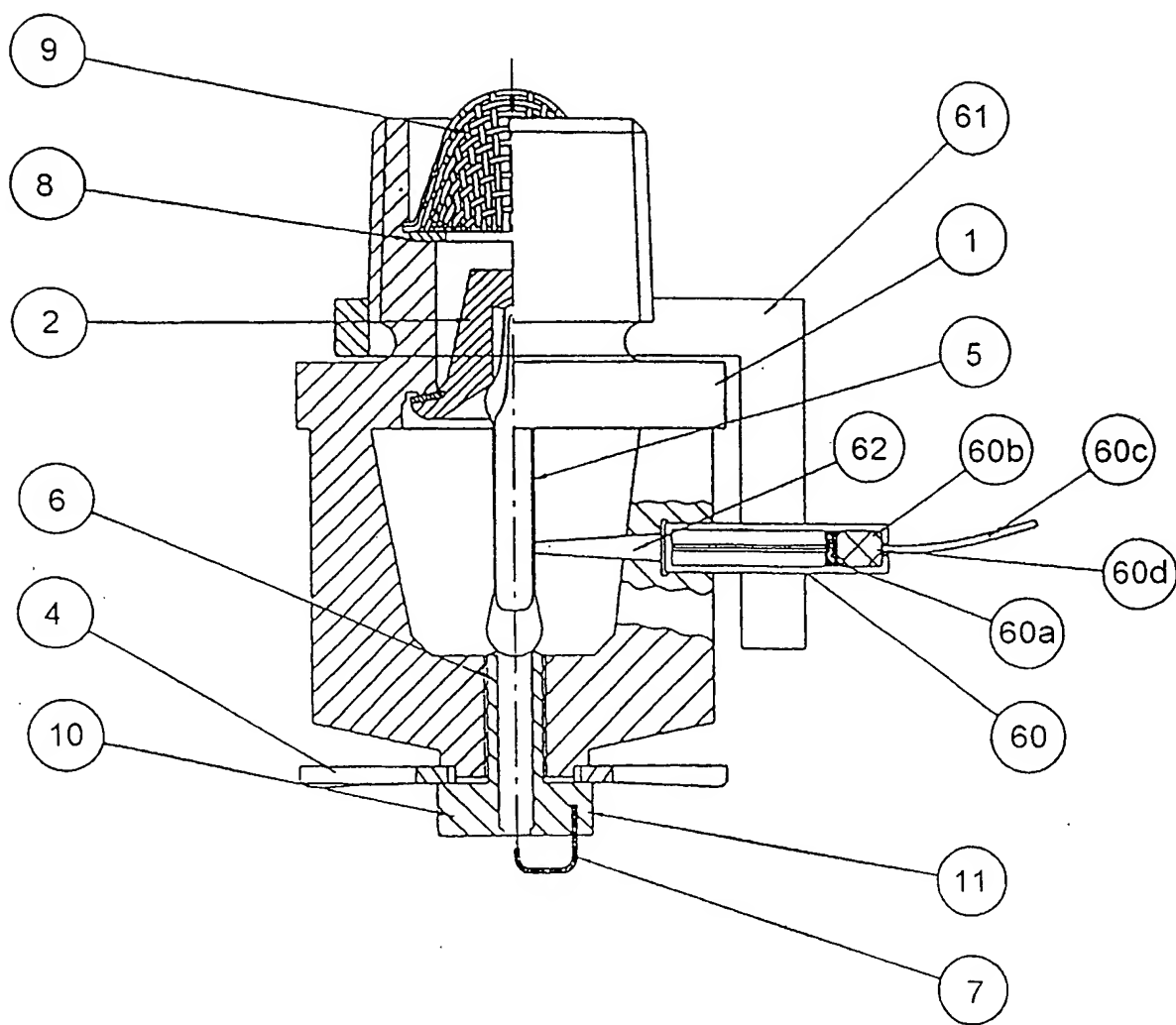


Fig. 6

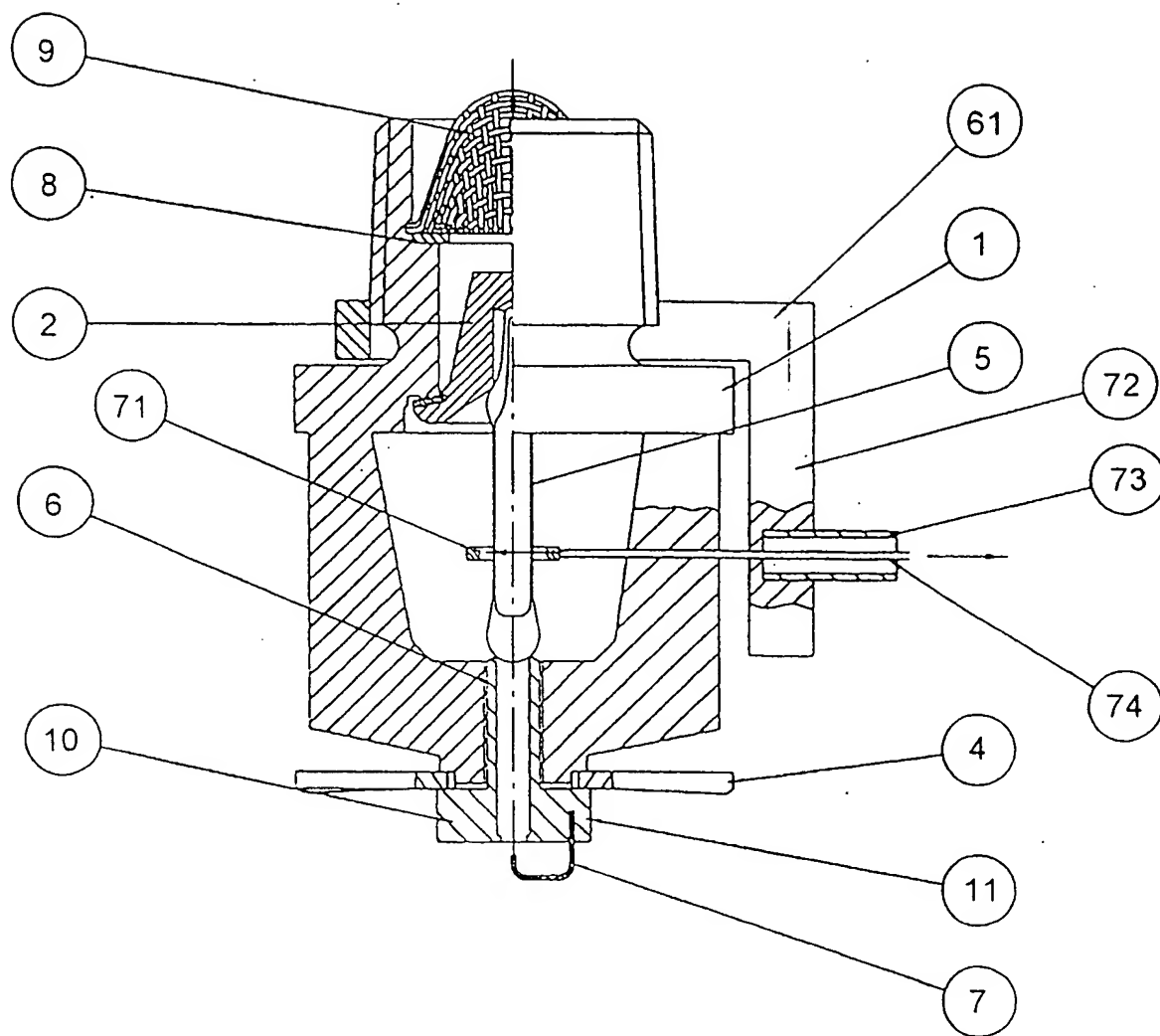


Fig. 7

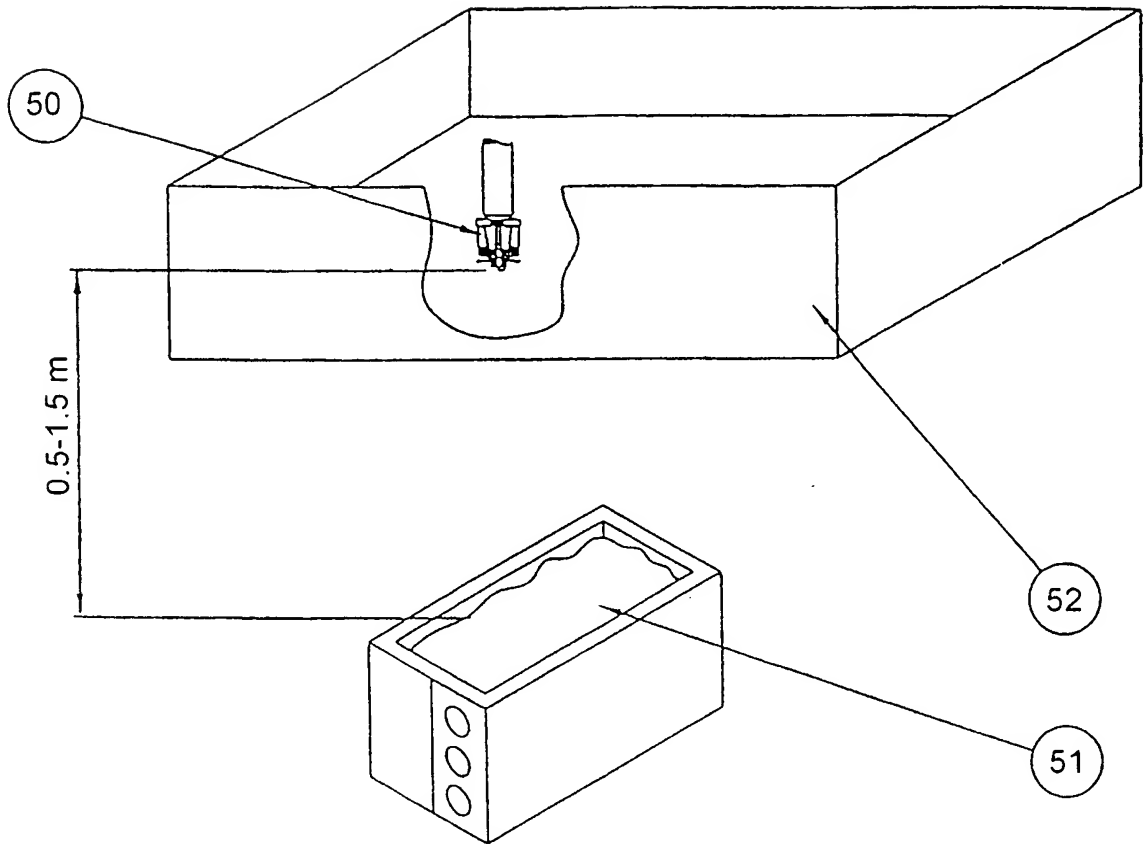


Fig. 8

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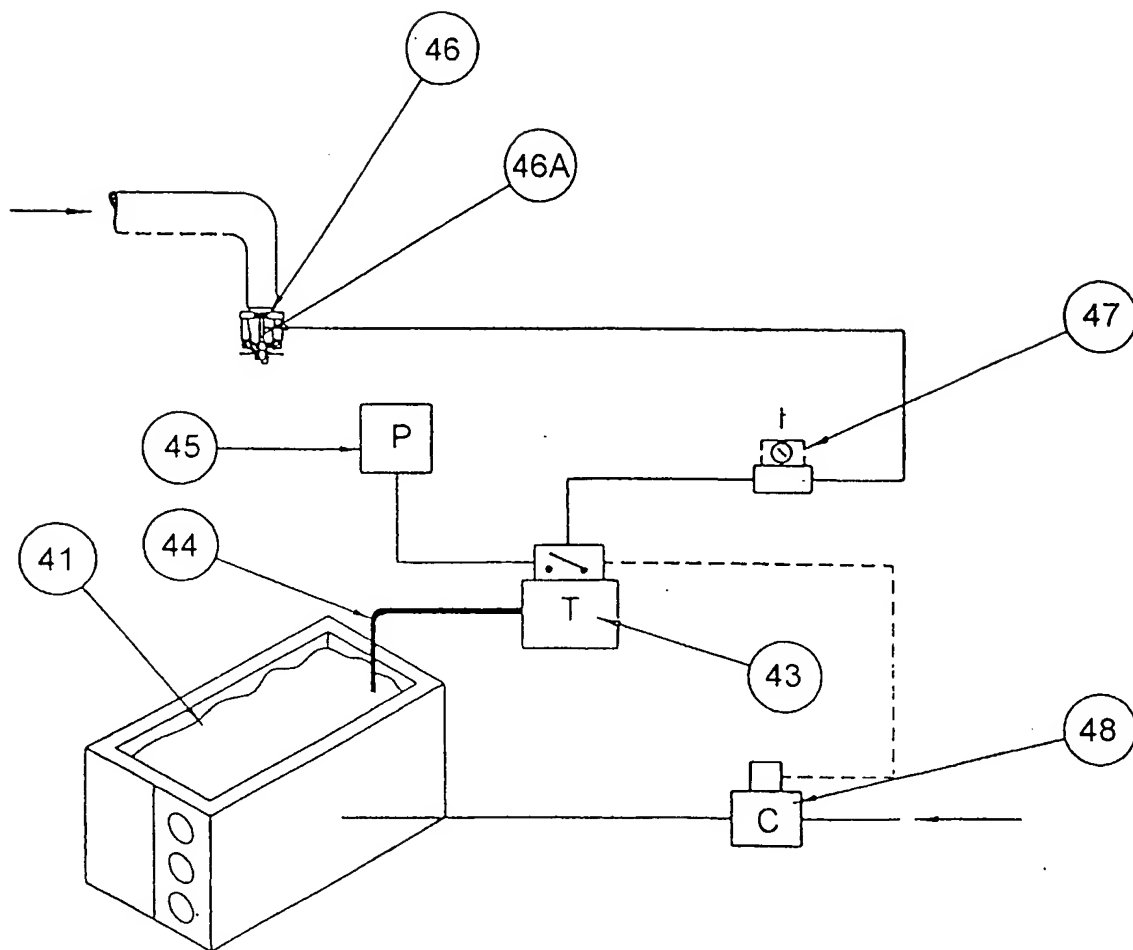


Fig. 9

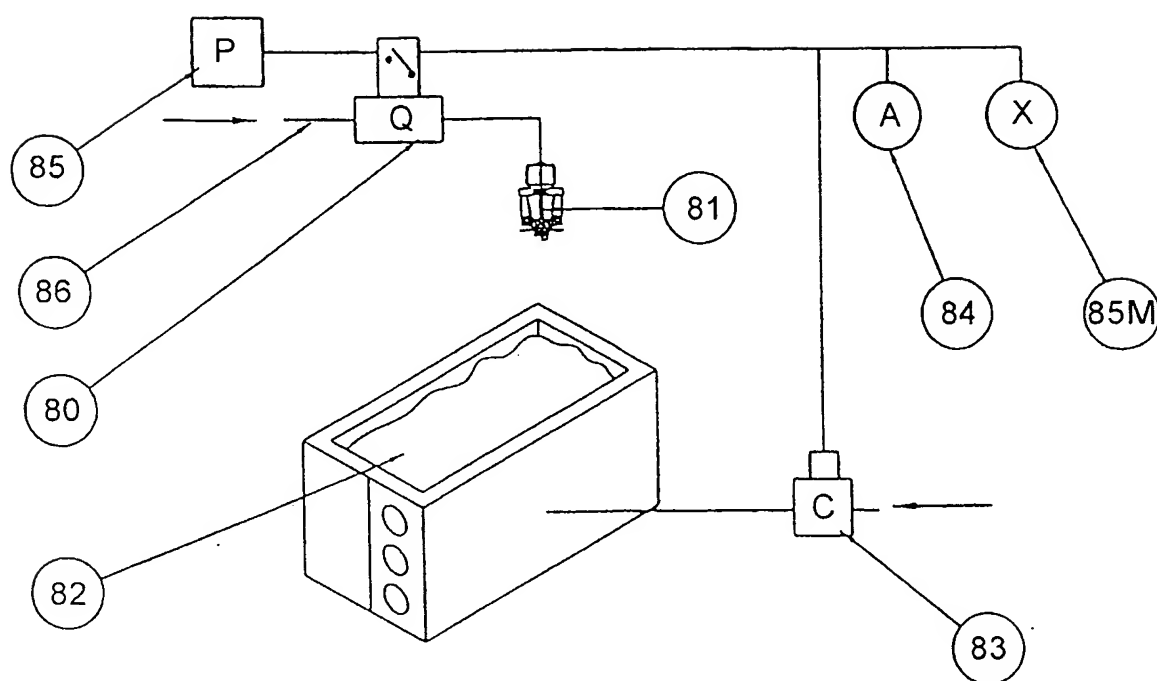


Fig. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 01/00041

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A62C 35/68, B05B 1/02, B05B 31/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A62C, B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 1674480 A (B.S. NELSON), 19 June 1928 (19.06.28), page 1, line 1 - line 53, figures 1-9	1
Y		2,3,4,5,8
A		6,7,9
	--	
Y	US 3802512 A (TODTENKOPF), 9 April 1974 (09.04.74), column 2, line 55 - column 3, line 21, figures 2,3	2-5,8
	--	
A	US 3884305 A (LIVINGSTON), 20 May 1975 (20.05.75), figure 3	6
	--	

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

1 June 2001

Date of mailing of the international search report

07-06-2001

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 01/00041

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4091873 A (WERNER), 30 May 1978 (30.05.78), column 9, line 46 - column 2, line 22; column 3, line 23 - line 47; column 3, line 55 - column 4, line 2, figures 1-5	1
Y		2,3,4,5,8
A		6,7,9
	--	
X	US 2375528 A (J.G. DE FLON), 8 May 1945 (08.05.45), page 2, column 1, line 5 - column 1, line 45, figure 1	1
Y		2,3,5,8
A		4,6,7,9
	--	
X	US 2005600 A (A.B. TAPPEN), 18 June 1935 (18.06.35), page 1, column 1, line 27 - page 2, column 1, line 10, figure 2	1
Y		2,3,4,5,8
A		6,7,9
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK01/00041

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 1, 5-8
because they relate to subject matter not required to be searched by this Authority, namely:
see next sheet
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK01/00041

Claim 1 of the invention is not clear and concise and does not comply with Article 6 of PCT since the last paragraph of the claim states what form the water stream should have but not how it's formed in that way. The claim has only been searched in part disregarding this last paragraph.

Claim 5-8 all refer to another multiple dependant claim. This does not comply with Rule 6.4 (a) PCT .

INTERNATIONAL SEARCH REPORT

Information on patent family members

30/04/01

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Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	1674480	A	19/06/28	NONE		
US	3802512	A	09/04/74	CA	954563 A	10/09/74
				DE	2356723 A,B	10/10/74
				GB	1411169 A	22/10/75
				JP	49127500 A	06/12/74
US	3884305	A	20/05/75	US	3765446 A	16/10/73
US	4091873	A	30/05/78	US	4113021 A	12/09/78
US	2375528	A	08/05/45	NONE		
US	2005600	A	18/06/35	NONE		

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